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EXAMINER	
NGUYEN, KHIEM D	

ART UNIT	PAPER NUMBER
2823	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/686,943	RHODES, HOWARD E.
	Examiner	Art Unit
	Khiem D Nguyen	2823

-- The MAILING DATE of this communication app ars on the cov r sh et with the correspond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 August 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *60-83,85-87,89,90 and 94-99* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *60-83,85-87,89,90 and 94-99* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 October 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 60-83, 85-87, 89, 90 and 94-99 have been considered but are moot in view of the new ground(s) of rejection.

New Grounds of Rejection

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 60-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (U.S. Patent 6,171,883) in view of Akio (U.S. Patent 5,691,548), Osawa et al. (U.S. Patent 6,071,443), and Fossum (U.S. Patent 5,887,049).

In re claims 60, 67, 71, and 72, **Fan** teaches a method of forming a microlens array for use in an imaging device, said method comprising the steps of (See col. 5, line 10 to col. 9 line 59 and **FIGS. 1-2**):

providing a substrate **(FIG. 1: 10)** having an array of pixel sensor cells **(FIG. 1: 12a, 12b, 12c, 12d)** formed thereon and a protective layer **(FIG. 1: 16)** over the cells;

forming a spacer layer **(FIG. 1: 22)** in contact with the protective layer wherein the spacer layer having a thickness of from about 20,000 to about 30,000 angstroms (2-3 μm) **(col. 7, lines 51-54);**

forming a lens forming layer over and in contact with the spacer layer;

forming a mircolens array **(FIG. 1: 24a, 24b, 24c, 24d)** from the lens forming layer; and forming a radiation transparent insulation layer **(FIG. 2: 25)** wherein the insulation layer includes silicon insulator material such as silicon nitride (col. 7, lines 42-43) on the microlens layers (col. 8, lines 45 to col. 9, line 59).

Fan fails to explicitly disclose wherein forming a radiation transparent insulation layer on the microlens array for increasing the proportion of radiation incident on the pixel sensor cells by extending the light-capturing capabilities beyond a periphery area surrounding each individual microlens of the microlens array, wherein the insulation layer includes silicon insulator material.

However, since Fan anticipated forming an encapsulant layer **(FIG. 2: 25)** on the microlens array **(FIG. 1: 24a, 24b, 24c, 24d)** wherein the general groups of encapsulant materials including but not limited to inorganic encapsulant materials having an index of refraction of from about 1.1 to about 1.5 (col. 8, line 45 to col. 9, line 11). Presented as evidence, **Scholz et al.** (U.S. Patent 5,997,621) disclose an insulation layer consisting silicon dioxide having an index of refraction of 1.2 to 1.4 (col. 5, lines 30-39). Scholz provides evidence that Fan contains the limitation of forming a radiation transparent insulation layer on the microlens array wherein the insulation layer may consist of silicon oxide. Therefore, Fan discloses forming a radiation transparent insulation layer on the microlens array and thus the disclose process would obtain the recited results in claim 60 (lines 8-11) because the same materials are treated in the same manner as in the instant invention.

In re claims 63-65, **Fan** fails to teach forming the lens forming layer by a spin-coating process wherein the lens forming layer is a layer of material selected from the group consisting of optical thermoplastic, polyimide, thermoset resin, photosensitive gelatin, and radiation curable resin and wherein the optical thermoplastic is selected from the group consisting of polymethylmethacrylate, polycarbonate, polyolefin, cellulose acetate butyrate, and polystyrene.

Akio teaches forming a lens layer by spin-coating technique using photosensitive resin based on thermoplastic resin wherein the thermoplastic is selected from polystyrene. See col. 9, lines 15-34. It would have been obvious to one of ordinary skill in the art of making semiconductor to incorporate Akio teaching into Fan's method because in doing so it is possible to easily obtain an ideal concave lens configuration (col. 9, lines 40-41).

In re claim 66, **Fan** fails to teach that the radiation curable resin is selected from the group consisting of acrylate, methacrylate, urethane acrylate, epoxy acrylate, and polyester acrylate.

Osawa teaches forming a lens sheet using radiation curable resin selected from urethane acrylate (col. 6, lines 41-53). It would have been obvious to one of ordinary skill in the art of making semiconductor to incorporate Osawa teaching into Fan's method because in doing so a lens sheet having no damage on the lens area can be obtained (col. 6, lines 41-53).

In re claims 61-62, **Fan** fails to teach that the substrate further comprises a CMOS pixel array of a CCD pixel array formed thereon.

Fossum teaches a substrate **101** comprises a CMOS pixel array **104** or a CCD pixel arrays formed thereon (col. 3, lines 3-17 and **FIG 1**). It would have been obvious to one of ordinary skill in the art of making semiconductor to incorporate Fossum teaching into Fan's method because doing so can speed up the processing speed and save memory space (col. 4, lines 54-56).

In re claim 68, **Fan** discloses wherein the insulation layer forming step comprises a chemical vapor deposition step (col. 8, line 45 to col. 9, line 11).

In re claims 69-70, **Fan** fails to teach that the low temperature is a temperature within the range of approximately 200 to 400 degrees Celsius.

However, there is no evidence indicating that the low temperature is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP § 2144.05.

3. Claims 73-83 and 85-86 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (U.S. Patent 6,171,883) in view of Akio (U.S. Patent 5,691,548), and Osawa et al. (U.S. Patent 6,071,443).

In re claims 73, 80, 81, 82, 85, and 86, **Fan** teaches a method of forming a microlens array for use in an imaging device, said method comprising the steps of (See col. 5, line 10 to col. 9 line 59 and **FIGS. 1-2**):

forming a lens forming layer on an imaging device;

treating the lens forming layer by thermally reflowed at a temperature within the range of approximately 144 to 176 degrees Celsius to form a plurality of microlenses

(FIG. 1: 24a, 24b, 24c, 24d) wherein a spacer layer **(FIG. 1: 22)** having a thickness of from about 20,000 to about 30,000 angstroms (2-3 μm) is formed under the microlens layers before formation of the lens forming layer (col. 7, lines 51-54); and

depositing a radiation transparent insulation layer **(FIG. 2: 25)** wherein the insulator layer includes silicon insulator material such as silicon nitride (col. 7, lines 42-43) on each microlens at a temperature of about 100° C (col. 10, lines 15-25).

Fan fails to explicitly disclose wherein forming a radiation transparent insulation layer on the microlens for increasing the proportion of radiation incident on the pixel sensor cells by capturing light from beyond the periphery of each individual microlens of the microlens array, wherein the insulation layer includes silicon insulator material.

However, since Fan anticipated forming an encapsulant layer on the microlens array wherein the general groups of encapsulant materials including but not limited to inorganic encapsulant materials having an index of refraction of from about 1.1 to about 1.5 (col. 8, line 45 to col. 9, line 11). Presented as evidence, Scholz et al. (U.S. Patent 5,997,621) disclose an insulation layer consisting silicon dioxide having an index of refraction of 1.2 to 1.4 (col. 5, lines 30-39). Scholz provides evidence that Fan contains the limitation of forming a radiation transparent insulation layer on the microlens array wherein the insulation layer may consist of silicon oxide. Therefore, Fan discloses forming a radiation transparent insulation layer on the microlens array and thus the disclose process would obtain the recited results in claim 73 (lines 5-8) because the same materials are treated in the same manner as in the instant invention.

In re claims 74-75, **Fan** fails to teach that the lens forming layer is a layer of material selected from the group consisting of optical thermoplastic, polyimide, thermoset resin, photosensitive gelatin, and radiation curable resin and wherein the optical thermoplastic is selected from the group consisting of polymethylmethacrylate, polycarbonate, polyolefin, cellulose acetate butyrate, and polystyrene.

Akio teaches forming a lens layer by spin-coating technique using photosensitive resin based on thermoplastic resin wherein the thermoplastic is selected from polystyrene (col. 9, lines 15-34). It would have been obvious to one of ordinary skill in the art of making semiconductor to incorporate Akio teaching into Fan's method because in doing so it is possible to easily obtain an ideal concave lens configuration (col. 9, lines 40-41).

In re claim 76, **Fan** fails to teach that the radiation curable resin is selected from the group consisting of acrylate, methacrylate, urethane acrylate, epoxy acrylate, and polyester acrylate.

Osawa teaches forming a lens sheet using radiation curable resin selected from urethane acrylate (col. 6, lines 41-53). It would have been obvious to one of ordinary skill in the art of making semiconductor to incorporate Osawa teaching into Fan's method because in doing so a lens sheet having no damage on the lens area can be obtained (col. 6, lines 41-53).

In re claims 77 and 78, **Fan** discloses wherein the treating step comprises a baking step and wherein the baking step is carried out at a temperature within the range of approximately 144 to 176 degrees Celsius (col. 7, lines 18-28).

In re claim 79, **Fan** discloses wherein treating step comprises a radiation exposure step (col. 7, lines 29-33).

In re claim 83, **Fan** discloses wherein the insulation layer forming step comprises a chemical vapor deposition step (col. 8, line 45 to col. 9, line 11).

4. Claims 87, 89, 90, and 94-98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (U.S. Patent 6,171,883) in view of Akio (U.S. Patent 5,691,548), and Fossum (U.S. Patent 5,887,049).

In re claim 87, 94, 97, and 98, **Fan** teaches a method of forming a microlens array for use in an imaging device, said method comprising the steps of (See col. 5, line 10 to col. 9 line 59 and **FIGS. 1-2**):

forming a lens forming layer or radiation curable resin on an imaging device;

patterning the lens forming layer to form a plurality of lens forming regions;

treating the plurality of lens forming regions with a radiation exposure step to form a plurality of microlens **(FIG. 1: 24a, 24b, 24c, 24d)** (col. 10, lines 15-25) wherein a spacer layer **(FIG. 1: 22)** having a thickness of from about 20,000 to about 30,000 angstroms (2-3 μm) is formed under the microlens layers before formation of the lens forming layer (col. 7, lines 29-59); and

forming a radiation transparent insulation layer **(FIG. 2: 25)** wherein the insulation layer includes silicon insulator material such as silicon nitride (col. 7, lines 42-43) on the plurality of microlenses (col. 8, lines 57-59).

Fan fails to explicitly disclose wherein forming a radiation transparent insulation layer on the plurality of microlens for increasing the proportion of radiation incident on

the pixel sensor cells by capturing light from beyond the periphery of each microlens of the plurality of microlenses, wherein the insulation layer includes silicon insulator material.

However, since Fan anticipated forming an encapsulant layer on the microlens array wherein the general groups of encapsulant materials including but not limited to inorganic encapsulant materials and organic encapsulant materials having an index of refraction of from about 1.1 to about 1.5 (col. 8, line 45 to col. 9, line 11). Presented as evidence, **Scholz et al.** (U.S. Patent 5,997,621) disclose an insulation layer consisting silicon dioxide having an index of refraction of 1.2 to 1.4 (col. 5, lines 30-39). Scholz provides evidence that Fan contains the limitation of forming a radiation transparent insulation layer on the microlens array wherein the insulation layer may consist of silicon oxide. Therefore, Fan discloses forming a radiation transparent insulation layer on the microlens array and thus the disclose process would obtain the recited results in claim 87 (lines 7-10) because the same materials are treated in the same manner as in the instant invention.

In re claims 89, and 90, **Fan** fails to teach that the substrate further comprises a CMOS pixel array of a CCD pixel array formed thereon.

Fossum teaches a substrate **101** comprises a CMOS pixel array **104** or a CCD pixel arrays formed thereon (col. 3, lines 3-17 and **FIG. 1**) It would have been obvious to one of ordinary skill in the art of making semiconductor to incorporate Fossum teaching into Fan's method because doing so can speed up the processing speed and save memory space (col. 4, lines 54-56).

In re claim 95, **Fan** discloses wherein the insulation layer forming step comprises a chemical vapor deposition step (col. 8, line 45 to col. 9, line 11).

In re claim 96, **Fan** fails to teach wherein said insulation layer forming step comprises a plasma deposition step carried out at a temperature within the range of approximately 200 to 400 degrees Celsius as recited in present claim 96.

However, there is no evidence indicating that the temperature of the plasma deposition step is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP § 2144.05.

5. Claim 99 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. (U.S. Patent 6,171,883) in view of Akio (U.S. Patent 5,691,548)

In re claim 99, **Fan** teaches a method of forming a microlens array for use in an imaging device, said method comprising the steps of (See col. 5, line 10 to col. 9 line 59 and **FIGS. 1-2**):

forming a lens forming layer on an imaging device;

patterning the lens forming layer to form a plurality of lens forming regions;

heat treating the plurality of lens forming regions to form a plurality of microlenses **(FIG. 1: 24a, 24b, 24c, 24d)** (col. 7, lines 4-28); and

depositing a radiation transparent insulation layer **(FIG. 2: 25)** wherein the insulator layer includes silicon insulator material such as silicon nitride (col. 7, lines 42-43) on the plurality of microlenses at a temperature of about 100° C (col. 10, lines 15-25).

Fan fails to explicitly disclose depositing a radiation transparent insulation layer on the plurality of microlenses for increasing the proportion of radiation incident on the pixel sensor cells extenind the light-capturing capabilities beyond the periphery of each individiual microlens of the plurality of microlenses, wherein the insulation layer includes silicon insulator material.

However, since Fan anticipated forming an encapsulant layer on the microlens array wherein the general groups of encapsulant materials including but not limited to inorganic encapsulant materials and organic encapsulant materials having an index of refraction of from about 1.1 to about 1.5 (col. 8, line 45 to col. 9, line 11). Presented as evidence, **Scholz et al.** (U.S. Patent 5,997,621) disclose an insulation layer consisting silicon dioxide having an index of refraction of 1.2 to 1.4 (col. 5, lines 30-39). Scholz provides evidence that Fan contains the limitation of forming a radiation transparent insulation layer on the microlens array wherein the insulation layer may consist of silicon oxide. Therefore, Fan disclose forming a radiation transparent insulation layer on the microlens array and thus the disclose process would obtain the recited results in claim 99 (lines 9-12) because the same materials are treated in the same manner as in the instant invention.

Fan fails to teach that the lens forming layer is a layer of material selected from the group consisting of optical thermoplastic, polyimide, and thermoset resin.

Akio teaches forming a lens layer by spin-coating technique using photosensitive resin based on thermoplastic resin (col. 9, lines 15-34). It would have been obvious to one of ordinary skill in the art of making semiconductor to incorporate Akio teaching into

Fan's method because in doing so it is possible to easily obtain an ideal concave lens configuration (col. 9, lines 40-41).

Response to Amendment

Response to Arguments

Applicant's arguments with respect to claims 60-83, 85-87, 89, 90 and 94-99 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (703) 306-0210. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-9179 for regular communications and (703) 746-9179 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.
November 7, 2003

W. DAVID COLEMAN
PRIMARY EXAMINER